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## DRAWINGS ATTACHED

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 (23) Complete Specification filed 16 July 1969  
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 (51) International Classification F 16 c 11/08  
 (52) Index at acceptance E2F 1T1 3DX 3F  
 (72) Inventors PETER FREDERICK BAKER and PETER MORLEY-SMITH



## (54) IMPROVEMENTS RELATING TO BALL JOINTS

(71) We, QUINTON HAZELL (HOLDINGS) LIMITED, a British Company of Colwyn Bay, North Wales, do hereby declare the invention for which we pray that a Patent may be granted to us and the method by which it is to be performed to be particularly described in and by the following statement:—

This invention relates to ball joints of the kind comprising a ball pin having a stem portion and a part-spherical ball portion and a housing including two part-spherical seats

intended for connection to a track rod end of the steering mechanism of a road vehicle,

Figure 2 is a similar view to Figure 1 but showing a further form of ball joint also intended for connection to a track rod end, and,

Figure 3 is a similar view to Figures 1 and 2 but showing a still further form of ball joint which is intended as a load bearing joint for, for example, a suspension system of a road vehicle.

For convenience similar reference numerals are used in the views to joints. The ball joint comprises a ball pin having a stem portion and a part-spherical ball portion of the ball pin which is closed at one end

## ERRATUM

SPECIFICATION No. 1,260,144

Page 1, line 11, for "sets" read "seats"

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resistance to relative rotary movement between the ball pin and the housing and which constant resistance is not obtainable in known joints in which the two seats are made of the same material, for example, nylon.

It is an object of the present invention to provide an improved ball joint of the kind specified.

According to the present invention in a ball joint of the kind specified one seat is made of nylon or of an acetal resin and the other seat is made of polyurethane of a solid physical structure.

Ball joints constructed in accordance with the present invention will now be more particularly described by way of example with reference to the accompanying drawings in which:—

Figure 1 is a sectional view of a ball joint

which includes an annular portion affording a cylindrical recess 28 and extending from the exterior of the body is a stem 30 of which the end portion is screw-threaded at 32 for attachment to a track rod.

The open end 20 of the housing is formed with an intumed annular flange abutment 34 provided with an elongated slot 36 through which a necked part 38 of the ball pin 10 extends and which necked part is between the ball portion 16 and the stem portion 12 and the longitudinal axis of the elongated slot 36 is parallel with the longitudinal axis of the stem 30 and the width of the slot is greater than the major diameter of the stem portion 12.

An annular nylon seat 40 is inserted into the recess 28 to bear against the flange abutment 34 at the open end of the housing and the external diameter of the nylon seat is substan-

SEE ERRATA SLIP ATTACHED

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(54) IMPROVEMENTS RELATING TO BALL JOINTS

(71) We, QUINTON HAZELL (HOLDINGS) LIMITED, a British Company of Colwyn Bay, North Wales, do hereby declare the invention for which we pray that a Patent may be granted to us and the method by which it is to be performed to be particularly described in and by the following statement:—

This invention relates to ball joints of the kind comprising a ball pin having a stem portion and a part-spherical ball portion and a housing including two part-spherical sets between and by which the ball portion is supported in a rotatable manner. Such ball joints are referred to herein as ball joints of the kind specified.

Whilst the ball pins and housings of ball joints are normally subjected to relative rotary movement they are also subjected to thrust forces and impact shocks and to absorb these it is necessary to enable the seats to move or "give" slightly and this has been obtained either by inherent resilience of the seats or by subjecting them to spring biasing influences. Furthermore it is desirable that the joint, throughout its entire life, offers a constant resistance to relative rotary movement between the ball pin and the housing and which constant resistance is not obtainable in known joints in which the two seats are made of the same material, for example, nylon.

It is an object of the present invention to provide an improved ball joint of the kind specified.

According to the present invention in a ball joint of the kind specified one seat is made of nylon or of an acetal resin and the other seat is made of polyurethane of a solid physical structure.

Ball joints constructed in accordance with the present invention will now be more particularly described by way of example with reference to the accompanying drawings in which:—

Figure 1 is a sectional view of a ball joint

intended for connection to a track rod end of the steering mechanism of a road vehicle, 45

Figure 2 is a similar view to Figure 1 but showing a further form of ball joint also intended for connection to a track rod end, and,

Figure 3 is a similar view to Figures 1 and 2 but showing a still further form of ball joint which is intended as a load bearing joint for, for example, a suspension system of a road vehicle. 50

For convenience similar reference numerals will be used throughout the several views to denote corresponding parts of the ball joints. 55

Referring to Figure 1, the ball joint comprises a metal ball pin 10 having a stem portion 12 which is screw-threaded at one end at 14 and at the other end has a part-spherical ball portion 16, and a housing 18 in which the ball portion 16 is disposed and the stem portion 12 extends through an open end 20 of the housing of which the opposite end 22 is closed. 60

The housing 18 consists of a body 24 which is conveniently made of metal and at one end 26 includes an annular portion affording a cylindrical recess 28 and extending from the exterior of the body is a stem 30 of which the end portion is screw-threaded at 32 for attachment to a track rod. 65

The open end 20 of the housing is formed with an intumed annular flange abutment 34 provided with an elongated slot 36 through which a necked part 38 of the ball pin 10 extends and which necked part is between the ball portion 16 and the stem portion 12 and the longitudinal axis of the elongated slot 36 is parallel with the longitudinal axis of the stem 30 and the width of the slot is greater than the major diameter of the stem portion 12. 70

An annular nylon seat 40 is inserted into the recess 28 to bear against the flange abutment 34 at the open end of the housing and the external diameter of the nylon seat is substan- 75

SEE ERRATA SLIP ATTACHED

5 tially equal to the bore diameter of the recess 28 and said nylon seat is formed with a part-spherical seat surface 42 to be engaged by the ball portion 16 and an end face 44 of the nylon seat remote from the open end 20 of the housing is disposed a small distance beyond a plane A—A containing the centre of the ball portion 16 and disposed at right-angles to the axis of the recess. 10 Disposed within the recess 28 at and adjacent the closed end 22 thereof is a sleeve in the form of a cup made of metal and having a cylindrical side wall 46 and an end wall 48 which latter is disposed at the closed end 22 of the housing and the sleeve is secured in position in the recess with an end face 50 of said sleeve abutting the end face 44 of the nylon seat 40 and this abutting relationship is maintained by peening over an end of the body 24 to form an inwardly extending annular flange abutment 52 which bears against the outer end face 54 of the end wall 48 of the cup.

25 Fitted within the cup so as to bear against the bore of the sleeve 46 and against the end wall 48 is an annular seat 56 made of polyurethane and this is formed with a part-spherical seat surface 58 to engage the ball portion 16 and an end face 60 of the polyurethane seat 56 is spaced a short distance from the adjacent end face 44 of the nylon seat so that the two seats do not contact each other.

30 The polyurethane is of a solid physical structure and in the assembled ball joint is in a state of compression to ensure that the ball portion 16 contacts both the nylon and polyurethane seats and the provision of a central hole 61 enables deformation of the seat to occur.

35 Whilst the ball joint is intended as a steering joint for the steering mechanism of a road vehicle and, therefore, is not intended as a load bearing ball joint, it should be appreciated that, even so, the joint will be subjected to slight loads, thrusts and impact shocks and these are mainly taken by the nylon seat 40 and the polyurethane seat 56 which is of a slightly more resilient nature will operate somewhat in the nature of a spring seat and will ensure that looseness or play does not develop in the joint even after it has been subjected to considerable wear.

50 A flexible dust cover 62 contacts the open end of the body 24 and the stem 112 of the ball pin to prevent dust entering the open end 20 of the housing 18.

55 Referring to Figure 2 the cylindrical side wall 46 is separate from the end wall 48 and these two parts are in abutting contact with each other. In other respects the ball joint illustrated in Figure 2 is very similar to the ball joint illustrated in Figure 1.

60 In the ball joints illustrated in Figures 1 and 2 the polyurethane seats 46 are of annular

formation but instead, said polyurethane seats may be of disc-like formation so as not to include a central hole.

The ball joint illustrated in Figure 3 is, as previously stated, a load bearing ball joint and this includes a ball pin 10 as previously described.

70 The housing 18 comprises a body 24 which is of substantially inverted cup-shaped formation affording a cup-shaped recess 28 defined by a cylindrical side wall 64 and an end wall abutment 66 which completely closes the recess at one end thereof and is disposed at the closed end 22 of the housing.

75 Disposed within the recess 28 is a disc-like seat 68 made of nylon and this disc fits against the bore of the recess 28 and against the end wall 66. Formed in the face of the nylon seat remote from the closed end 22 of the housing is a substantially hemi-spherical seat surface 58 which the ball portion 16 engages. Instead of the nylon seat 68 being in the form of a disc and affording a substantially hemi-spherical seat surface 70 said nylon seat may be of annular formation as indicated at 71 so as to afford an annular part-spherical seat.

80 Disposed within the recess 28 at or adjacent the open end 20 of the housing is a sleeve of substantially 'J' cross-sectional shape to afford a cylindrical side wall 72 which bears against the cylindrical surface of the recess 28 and at its end remote from the open end 20 of the housing the wall bears against an end face 74 of the nylon seat 68 which faces said open end of the housing. In addition to the cylindrical wall 72 the sleeve also includes an 85 intumed annular flange 76 and within this sleeve is disposed an annular seat 78 made of polyurethane which bears against the internal faces of the cylindrical wall 72 and the intumed annular flange 76 and is also provided with an annular part-spherical seat surface 58 which bears against the ball portion 16.

90 The sleeve is retained in position in the recess 28 by peening an annular flange abutment 34, which is integral with the body, inwardly so as to bear against the annular flange 76 whereby the polyurethane seat is held against the ball portion which is in turn urged against the nylon seat 68 and an end face 80 of the polyurethane seat abuts the end face 74 of the nylon seat.

95 The sleeve comprising the wall 72 and flange 76 may be of any other shape so as to afford a cylindrical side wall and an intumed flange.

100 In this form of ball joint illustrated in Figure 3 the nylon seat 68 takes the major load to which the ball joint is subjected and the polyurethane seat 78 ensures that looseness in the joint does not develop due to the polyurethane seat being of a more resilient nature than the nylon seat.

105 In any form of ball joint instead of the one

seat being made of nylon, the seat may be made of an acetal resin supplied under the Registered Trade Mark "Delrin".

5 It should be appreciated that in all forms of the invention the polyurethane seats are made of a material which is physically solid as distinct from expanded or foamed material.

10 If desired, either one or both seats may be spring-urged into and maintained in engagement with the ball portion and metal or rubber or other suitable springs may be used for this purpose.

15 It should be appreciated that ball joints of the kind specified and constructed in accordance with the present invention include at least two part-spherical seats of which at least one is made of nylon or an acetal resin and is so arranged, in use, that it is normally the load bearing seat and will normally withstand the major loads to which the joint is subjected whilst having anti-frictional qualities and at least another part-spherical seat is made of polyurethane which is more resilient than nylon or an acetal resin and is capable of providing the resiliency required to take up any wear that occurs in the joint especially as the polyurethane seat is assembled in the joint in a condition of slight compression and this polyurethane seat also exhibits anti-friction qualities sufficient for ball joint purposes.

30 Furthermore, ball joints according to the present invention offer a constant resistance to relative rotary movement between the ball pin and the housing throughout the lives of the joints so that a uniform performance is obtained from such a joint and which is very desirable when used, for example, in the steering or other handling systems of a motor road vehicle.

40 If desired the positions of the nylon or acetal resin seat and the polyurethane seat may be interchanged in the housing.

#### WHAT WE CLAIM IS:—

45 1. A ball joint of the kind specified wherein one seat is made of nylon or of an acetal resin and the other seat is made of polyurethane of a solid physical structure.

2. A ball joint according to Claim 1 wherein the polyurethane seat is of annular formation.

3. A ball joint according to Claim 2 wherein the polyurethane seat is disposed at a closed end of the housing. 50

4. A ball joint according to Claim 1 wherein the polyurethane seat is of disc-like formation.

5. A ball joint according to Claim 1 wherein the nylon or acetal resin seat is of annular formation. 55

6. A ball joint according to Claim 5 wherein the nylon or acetal resin seat is disposed at a closed end of the housing. 60

7. A ball joint according to Claim 1 wherein the nylon or acetal resin seat is of disc-like formation.

8. A ball joint according to any of the preceding claims wherein the housing comprises a body part affording a recess therein in which is disposed a sleeve of which one end bears against an abutment at one end of the recess and located in the sleeve is the polyurethane seat and the nylon or acetal resin seat is located in the recess and bears at one end against an abutment at the other end of the recess and said nylon or acetal resin seat bears at its other end against the other end of the sleeve to hold said one end of the sleeve against the said abutment. 70

9. A ball joint constructed substantially as described herein with reference to and as shown in Figure 1 of the accompanying drawings. 75

10. A ball joint constructed substantially as described herein with reference to and as shown in Figure 2 of the accompanying drawings. 80

11. A ball joint constructed substantially as described herein with reference to and as shown in Figure 3 of the accompanying drawings. 85

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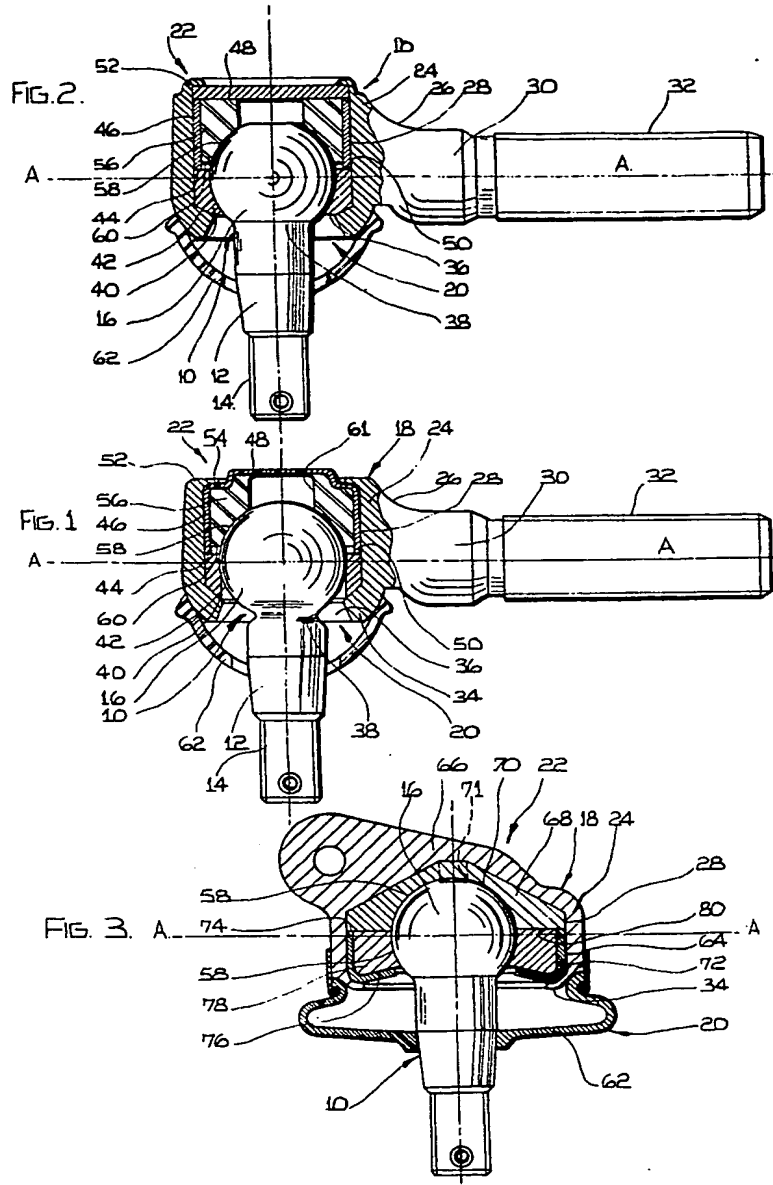
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